

What is claimed is:

1. A pump unit comprising:

at least one hydraulic pump with inlet and outlet ports formed therein;

a pump case for accommodating said at least one hydraulic pump, said pump case having an opening through which said at least one hydraulic pump is insertable into the pump case;

a center section connected to said pump case in such a manner as to close said opening of the pump case;

said center section forming a pair of inlet/outlet passages having first ends respectively communicating with said inlet and outlet ports of said at least one hydraulic pump and second ends opening to the outside of the center section through a pump case abutting surface of the center section, and a first charging passage having a first end through which working hydraulic fluid is fed into the center section and a second end opening to the outside of the center section through said pump case abutting surface of the center section;

at least one of said pump case and said center section forming a communication passage for communication between said second ends of the pair of inlet/outlet passages and said second end of the first charging passage;

a first hydraulic fluid feeding valve for allowing hydraulic fluid to flow from said first charging passage to said pair of inlet/outlet passages while preventing the reverse flow; and

said first hydraulic fluid feeding valve being installable through said pump case abutting surface of the center section or a center section abutting surface of the pump case.

2. A pump unit according to claim 1, wherein:

said pump case reserves the hydraulic fluid.

3. A pump unit according to claim 1, wherein:

said working hydraulic fluid fed into said first charging passage through the

first end thereof is hydraulic fluid fed from a charge pump operatively

connected to a driving shaft for driving said at least one hydraulic pump;

said center section forms a second charging passage for communication

between the inside of said pump case and said first charging passage; and

said second charging passage prevents the flow of the hydraulic fluid from said

first charging passage into said pump case, while allowing the hydraulic

fluid reserved within said pump case to flow into said first charging

passage when negative pressure is generated in at least one of said pair of

inlet/outlet passages.

4. A pump unit according to claim 1, wherein:

said communication passage has a groove shape and is formed in said center

section abutting surface of the pump case; and

said pump case has said center section abutting surface forming an escape

groove communicating with the inside of the pump case for the escape of

the hydraulic fluid leaked.

5. A pump unit according to claim 1, wherein:

said center section forms a bypass passage for communication between said

pair of inlet/outlet passages; and

said bypass passage is provided with an open/close valve in such a manner as

to be operable from the outside for communication and cutoff of the

hydraulic fluid between said pair of inlet/outlet passages.

6. A pump unit comprising:

a first hydraulic pump with inlet and outlet ports formed therein;

a second hydraulic pump with inlet and outlet ports formed therein disposed parallel to said first hydraulic pump;

a pump case for accommodating said first hydraulic pump and said second hydraulic pump, said pump case having an opening through which said first hydraulic pump and said second hydraulic pump are insertable into the pump case;

a center section connected to said pump case in such a manner as to close said opening of the pump case;

said center section forming a first pair of inlet/outlet passages having first ends respectively communicating with said inlet and outlet ports of said first hydraulic pump and second ends opening to the outside of the center section through a pump case abutting surface of the center section, a second pair of inlet/outlet passages having first ends respectively communicating with said inlet and outlet ports of said second hydraulic pump and second ends opening to the outside of the center section through said pump case abutting surface of the center section, and a first charging passage having a first end through which working hydraulic fluid is fed into the center section and a second end opening to the outside of the center section through said pump case abutting surface of the center section;

at least one of said pump case and said center section forming a communication passage for communication said second ends of the pair of first inlet/outlet passages and the pair of second inlet/outlet passages to said second end of

the first charging passage;
a first hydraulic fluid feeding valve for allowing the flow of hydraulic fluid from
said first charging passage to said pair of inlet/outlet passage and said
second pair of inlet/outlet passages; and
said first hydraulic fluid feeding valve being installable through said pump
case abutting surface of the center section or a center section abutting
surface of the pump case.

7. A pump unit comprising:

a first hydraulic pump and a second hydraulic pump respectively connected to
first and second actuators via a first pair of hydraulic lines and a second
pair of hydraulic lines, said first hydraulic pump and said second hydraulic
pump accommodated within a common housing, the former being disposed
parallel to the latter;
said first and second hydraulic pumps supported on a common center section;
and
said common center section forming a first pair of inlet/outlet ports and a
second pair of inlet/outlet ports, said first pair of inlet/outlet ports
respectively serving as connection ports for connection with said first pair
of inlet/outlet hydraulic lines, and said second pair of inlet/outlet ports
respectively serving as connection ports for connection with said second
pair of inlet/outlet hydraulic lines.

8. A pump unit according to claim 7, wherein:

said common center section forms a common charging passage for feeding
pressurized hydraulic fluid into said first pair of hydraulic lines and said
second pair of hydraulic lines.

9. A pump unit according to claim 7, wherein:

said first and second inlet/outlet ports are formed in the same side of said common center section.

10. A pump unit according to claim 7, wherein:

said first hydraulic pump and said second hydraulic pump respectively have pump shafts connected together by a power transmission mechanism provided in said common housing; and

said common housing includes a partition wall through which said pump shafts of said first hydraulic pump and said second hydraulic pump can pass, said partition wall dividing said common housing into a pump accommodation chamber and a power transmission mechanism accommodation chamber.

11. A pump unit according to claim 10, wherein:

said first hydraulic pump and said second hydraulic pump are of an axial piston type that include angularly adjustable swash plates of a cradle type, said angularly adjustable swash plates respectively having rear sides forming spherical convex surfaces, while said partition wall forming guiding surfaces respectively sized and shaped to slidingly guide said spherical convex surfaces of said angularly adjustable swash plates.

12. A pump unit used for a vehicle with first and second hydraulic motors respectively connected to the right and left drive wheels comprising:

a first hydraulic pump and a second hydraulic pump, both being of a variable displacement type located parallel to one another within a common housing, and respectively operable in association with said first and second

hydraulic motors;
said first hydraulic pump and said second hydraulic pump respectively including a first pump shaft and a second pump shaft located parallel to one another within said common housing and operatively connected to one another via a power transmission mechanism, and said first control shaft and said second control shaft designed for controlling the input/output flow rates of said first and second hydraulic pumps; and
said first control shaft and said second control shaft respectively extending away from one another along the vehicle width direction.

13. A pump unit according to claim 12, wherein:

said first control shaft and said second control shaft are located substantially at the same position with respect to the vehicle longitudinal direction.

14. A pump unit according to claim 12, wherein:

said housing includes a partition wall between said first and second hydraulic pumps, and said power transmission mechanism, through which said first pump shaft and said second pump shaft can extend, and
said partition wall divides said housing into a hydraulic pump accommodation chamber and a power transmission mechanism accommodation chamber.

15. A pump unit according to claim 14, wherein:

said first hydraulic pump and said second hydraulic pump are of an axial piston type that respectively include angularly adjustable swash plates of a cradle type respectively having rear sides forming spherical convex surfaces; and
said partition wall forming guiding surfaces respectively sized and shaped to

slidingly guide the spherical convex surfaces of said angularly adjustable swash plates.

16. A pump unit for operation in association with first and second actuators comprising:

a first hydraulic pump and a second hydraulic pump respectively connected to said first and second actuators via a first pair of hydraulic lines and a second pair of hydraulic lines;

a center section supporting said first hydraulic pump and said second hydraulic pump;

a housing accommodating said first hydraulic pump and said second hydraulic pump;

wherein said first hydraulic pump, said second hydraulic pump, said first pair of hydraulic lines, said second pair of hydraulic lines, said center section and said housing are integrally connected together to constitute a single unit; and

a reservoir tank supportingly connected to said single unit for storing hydraulic fluid to be replenished to said first pair of hydraulic lines and said second pair of hydraulic lines.

17. A pump unit according to claim 16, wherein:

said single unit is designed so that the housing can serve as a hydraulic fluid tank; and

the pump unit further comprises a hydraulic fluid communication passage for providing a free fluid communication between said reservoir tank and said housing.

18. A pump unit according to claim 17, wherein:

said center section is formed as a single unit for supporting both said first and second hydraulic pumps;

said center section forms a first pair of hydraulic passages respectively having first ends communicating with said first hydraulic pump and second ends opening to the outside of said center section to form connection ports for connection with said first pair of hydraulic lines, a second pair of hydraulic passages respectively having first ends communicating with said second hydraulic pump and second ends opening to the outside of said center section to form connection ports for connection with said second pair of hydraulic lines, and a charging passage having a first end opening to the outside of said center section to form an inlet port for charging, serving as an inlet for the hydraulic fluid to be replenished and a second end communicating with said first pair of hydraulic passages and said second pair of hydraulic passages via check valves;

said charging passage is connected to a pressure relief line communicating with said housing via a relief valve; and

said inlet port for charging is connected to said reservoir tank via a hydraulic fluid replenishing passage.

19. A pump unit according to claim 17, wherein:

said center section includes a first center section and a second center section respectively supporting said first hydraulic pump and said second hydraulic pump;

said first center section forms a first pair of hydraulic passages respectively having first ends communicating with said first hydraulic pump and second ends opening to the outside of said first center section to form

connection ports for connection with said first pair of hydraulic lines;
said second center section forms a second pair of hydraulic passages
respectively having first ends communicating with said second hydraulic
pump and second ends opening to the outside of said second center section
to form connection ports for connection with said second pair of hydraulic
lines;
at least one of said first and second center sections forms a charging passage
having a first end opening to the outside of said at least one of said first
and second center sections to form an inlet port for charging, serving as an
inlet for the hydraulic fluid to be replenished, and a second end
communicating with said first pair of hydraulic passages and said second
pair of hydraulic passages via check valves;
said charging passage is connected to a pressure relief line communicating
with the inside of said housing via a relief valve; and
said inlet port for charging is connected to said reservoir tank via a hydraulic
fluid replenishing passage.

20. A pump unit according to claim 18, wherein:

a cooling fan is provided near said single unit, said cooling fan adapted to be
driven in synchronism with said first and second hydraulic pumps;
said reservoir tank is connected to said single unit in such a manner as to form
a clearance therebetween into which a cooling air stream is drawn from
said cooling fan; and
said hydraulic fluid communication passage and said hydraulic fluid
replenishing passage are disposed in such a manner as to traverse said
clearance.

21. A pump unit for operation in association with first and second actuators comprising:

a first hydraulic pump and a second hydraulic pump respectively connected to said first and second actuators via a first pair of hydraulic lines and a second pair of hydraulic lines;

a center section supporting said first hydraulic pump and said second hydraulic pump;

a housing accommodating said first hydraulic pump and said second hydraulic pump, said housing adapted to be used as a hydraulic fluid tank;

a hydraulic fluid circulation mechanism for taking the hydraulic fluid from the hydraulic tank, and again returning the same to said hydraulic tank; and said hydraulic fluid circulation mechanism designed to cool the hydraulic fluid while circulating the same.

22. A pump unit according to claim 21, wherein:

said circulation mechanism includes a circulation line, at least a portion of which serves as a conduit, said circulation line having a first end communicating with the inside of said hydraulic tank and a second end again communicating with the inside of said hydraulic tank; and said conduit has at least a portion provided thereon with cooling fins.

23. A pump unit according to claim 22, wherein:

said center section is a unitary member on which said first and second

hydraulic pumps are supported in parallel relationship with one another;

said housing forms an opening in a side thereof, through which said first and second hydraulic pumps can pass;

said center section and said housing are integrally connected together to form a

single unit, so that said opening of the housing can be sealed in a liquid tight manner by said center section with said first and second hydraulic pumps supported thereon;

said center section forms a first pair of hydraulic passages respectively having first ends communicating with said first hydraulic pump and second ends opening to the outside of said center section to form connection ports for connection with said first pair of hydraulic lines, a second pair of hydraulic passages respectively having first ends communicating with said second hydraulic pump and second ends opening to the outside of said center section to form connection ports for connection with said second pair of hydraulic lines, and a charging passage having a first end communicating with said hydraulic fluid tank to form an inlet port for charging, serving as an inlet for the hydraulic fluid to be replenished and a second end communicating with said first pair of hydraulic passages and said second pair of hydraulic passages via check valves; and

said pump unit further comprises:

- a charge pump for sucking the hydraulic fluid stored within said hydraulic fluid tank and then discharging the same into said inlet port for charging;

- a pressure relief line having a first end connected to said charging passage via a relief valve and a second end forming a drain port through which the hydraulic fluid from said relief valve is drained; and

- a pipe connecting said second end of the pressure relief line with said hydraulic fluid tank;

wherein said pipe constitutes said conduit, and said charge pump constitutes a part of said hydraulic fluid circulation mechanism.

24. A pump unit according to claim 22, wherein:

said center section includes a first center section and a second center section respectively supporting said first and second hydraulic pumps;

said housing has first and second sidewalls facing one another and respectively forming a first opening and a second opening through which said first hydraulic pump and said second hydraulic pump can respectively pass;

said first and second center sections are integrally connected to said housing to form a single unit, so that said first and second openings of said housing are sealed in a liquid tight manner by said first and second center sections respectively supporting said first and second hydraulic pumps thereon;

said first center section forms a first pair of hydraulic passages respectively having first ends communicating with said first hydraulic pump and second ends opening to the outside of said first center section to form connection ports for connection with said first pair of hydraulic lines;

said second section forms a second pair of hydraulic passages respectively having first ends communicating with said second hydraulic pump and second ends opening to the outside of said second center section to form connection ports for connection with said second pair of hydraulic lines;

at least one of said first and second center sections forms a charging passage having a first end communicating with said hydraulic fluid tank to form an inlet for the hydraulic fluid to be replenished and a second end communicating with said first pair of hydraulic passages and said second pair of hydraulic passages via check valves; and

said pump unit further comprises:

a charge pump for sucking the hydraulic fluid stored within said hydraulic fluid tank and then discharging the same into said

inlet port for charging;
a pressure relief line having a first end connected to said charging
passage via a relief valve and a second end forming a drain port
through which the hydraulic fluid from said relief valve is
drained; and
a pipe connecting said second end of the pressure relief line with said
hydraulic fluid tank;
wherein said pipe constitutes said conduit, and said charge pump
constitutes a part of said hydraulic fluid circulation mechanism.

25. A pump unit according to claim 23, further comprising a reservoir tank,
wherein:

said reservoir tank is in free fluid communication with said housing via a
hydraulic fluid communication passage, and forms a hydraulic fluid tank
in cooperation with said housing; and
said inlet port for charging communicates with said reservoir tank via a
hydraulic fluid replenishing passage.

26. A pump unit according to claim 25, wherein cooling fins are provided on
said hydraulic fluid replenishing passage and said hydraulic fluid communication
passage.

27. A pump unit according to claim 25, wherein:

a cooling fan adapted to be driven in synchronism with said first and second
hydraulic pumps is provided near said single unit;
said reservoir tank is connected to said single unit in such a manner as to form
a clearance therebetween, into which a cooling air stream from said cooling

fan is drawn; and
said hydraulic fluid communication passage and said hydraulic fluid
replenishing passage are disposed to transverse said clearance.

28. A pump unit according to claim 27, wherein a cooling air duct is provided so that a cooling air stream from said cooling fan is drawn into said clearance along said cooling air duct.